LCA and Ecolabelling

The Agro-Production Chain

Environmental Management in the Agricultural Production-Consumption Chain

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Abstract

After promoting environmental certification of companies in a chain perspective (Udo de Haes & De Snoo, 1996) now the agro-production chain is worked out as a case study. The role of the different links in the chain, such as agricultural producers, processing industry, wholesale companies and retailers is discussed. Also the role of consumers and authorities is described. For every company in the chain the advantages of a company based approach will be a better image and a guaranteed sale and/or supply. In comparison with a product based approach (ecolabelling) the steering forces in the agro-production chain will be the retailers and not the consumers. Because consumers only get information at company level the approach is less dependent on consumers behaviour in the shop.

Keywords: Company certification; certification; environmental certification; product; company; LCA; life cycle assesment; life cycle approach; product policy; environmental management systems; EMAS; ISO; agricultural production; retailers

1 Introduction

In a previous issue of this journal we pointed out that market oriented environmental management, i.e., management beyond government requirements, may focus at quite different objects [1]. In particular, a focus on products and on companies can be seen as two complementary approaches. Both can be put in a chain perspective, i.e., both are examples of life cycle approaches. For products this leads to an analysis of a product system, including all processes related to the performance of a given unit of function. For companies this leads to a quite different set-up, mainly consisting of agreements between companies along a production-consumption chain, on basis of environmental management characteristics of companies as a whole.

The difference between the two approaches can be further illustrated on a number of points. Thus, they are quite distinct with respect to their driving force. For product policy, the main driving force are the consumers of the service. By their purchase behaviour, they are meant to influence all processes of the product system at stake. This both refers to situations in which different products are compared with each other, as in situations aiming at an environmental improvement of a product. Also there it is the consumer who will be the main target of the information about the environmental performance. For company based management, in as far as it goes beyond environmental standards, the driving force is rather the general image of the company. Of course this image will also influence consumers, but this influence is of a much less direct nature. It can be conveyed in annual reports or as general information about the company policy in advertisements.

Another difference concerns the methodology of environmental assessment. For products LCA is the appropriate analytical tool. Inventory input and output data and environmental impacts of all processes concerned are allocated quantitatively to the functional unit. A company based approach starts with the selection of companies which play a major role in the particular chain, socalled foreground processes [2]. For these individual companies the environmental performance is assessed. This method we may call "company ecobalance", which is in fact a gate-to-gate approach. The chain perspective regards agreements between companies, dealing with environmental requirements on supply and sale and has as yet no specific methodological basis. A consequence of this set-up is that a company based approach does not encounter the allocation problem[1].

A specific form of a company based approach is the awarding of environmental certificates to companies. First of all, this can be a clear aim for any single company. But such certification may also help to structure the agreements between companies in a production-consumption chain; or in terms of certification regulations it may also deal with indirect impacts. Thus, the selection of supplying companies for a retailer may be well guided by the fact whether the

[1] The present company based approach resembles the OBIA approach as presented by Taylor at the recent LCA case studies symposium in Brussels [3]. In the latter, also the functioning of a company is taken as a starting point. However, this company functioning is regarded as a functional unit for an otherwise traditional LCA approach. In the present contribution, the functional unit concept is not taken as a reference for further processes in the chain; links between companies in a chain are only of an organizational nature.

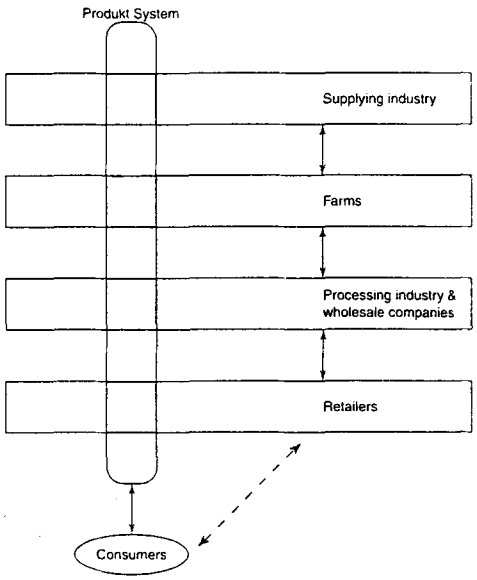
producers of the products concerned have an environmental certificate or not. A legal basis for environmental certification of companies can be found in the different procedures for environmental management systems for firms. Firstly, there is the British Standard BS7750, which subsequently formed the basis for the EMAS regulation of the EU [4] and the draft EMS international standard from ISO [5]. Up to now, these have focused on large firms only; they do not include MSE, i.e., medium and small enterprises. In addition, their scope is limited to the industrial sector. Finally, there are national systems of environmental management of companies, which have different legal bases. Such national schemes do not have the limitations of the above mentioned international programs.

Both chain management approaches have their potential and limitations. Thus, a company based approach as described here will not be able to designate environmentally superior products. In the earlier contribution, we gave the example of an aluminium can which may well be environmentally inferior to a reusable glass bottle, even if the aluminium smelter and the can factory have an environmental certificate and the glass factory has not. On the other hand, a company based approach has also distinct advantages. There is increasing evidence that the environmental strategy of a company should not be based on single products, but should rather include the management of the company as a whole [6]. The general reluctance of companies to engage in ecolabelling schemes is indicative in this respect. We want to stress here that a company based approach can also realize chain management, be it in a different way compared to a product based approach.

In the earlier contribution, we advocated that company certification in a life cycle perspective should be further investigated; and also that the relationship between the two types of life cycle approaches should be further analysed. In the present article, we make a step in this direction, focusing on the agricultural production-consumption chain. Firstly, we will give a general description of this chain and the environmental management related to it. Thereafter, we will describe in more detail the role of the different links in the chain. We conclude with a number of questions for further research and practice in this field.

2 The Agricultural Production-Consumption Chain

The agricultural production-consumption chain consists essentially of resource supplying industries, farms, processing industries (like dairy factories, slaughter-houses and tinning factories), retailers and consumers (see *Fig.* 1, in which the two cradle-to-gate approaches are presented). We will focus on food products, omitting non-food production. Historically, there was a focus on a company oriented approach. In the twenties the first organic farms developed, in particular with bio-dynamic practice. Since the sixties more types of organic farming systems developed, and also organic shops were established, often in close cooperation with motivated consumers. Many products got



The arrow between consumer and product system indicates the primary force for product oriented policy. For company certification the possible relationships between companies and with the consumer constitute the field of 'chain management' and are to be further explored.

Fig. 1: A simplified representation of product Life Cycle Assessment and certification of companies in an agricultural pre-consumer production-consumption chain; within the product system the grey areas the unit processes (or parts thereof) which comprise the product system (cf. Udo de Haes and de Snoo, 1996).

organic labels from national organisations. So, in fact, product and company oriented approaches were not clearly distinct in this period.

Recently, there is a tendency towards a more specific product oriented approach. An example is the dutch agro-eco-label on products like potatoes, wheat, (sweet) peppers and onions [7]. For these products almost only the culture of the crops is investigated. Detailed requirements are given for the use of fertilizer and pesticides. For example, in potatoes the maximum use of pesticides is 7 kg active ingredient per ha/year and only certain selected pesticides may be used based on there low toxicity for aquatic species, persistance and mobility. There are hardly any requirements for the practice of the farm as a whole apart from some requirements which are given for the management of ditch banks and treatment of wastes. This may become even more pronounced if these products will become included in the European ecolabelling scheme. Up to now, agricultural products were excluded from the European programme; but this is due to change. In the European ecolabelling programme the products are analysed by using LCA, which means that also burdens upstream and downstream from the farms will be taken into account; from LCA perspective, this is current practice, for organic food products this is new. Another characteristic feature of the use of the ecolabel programmes is the focus on intermediate levels of environmental management; i.e., the step from purely organic farms towards more integrated types of agriculture in which the use of chemicals is reduced instead of abolished.

This is linked with the aspiration level of ecolabelling policy, being well above the market share of organic produce in many countries.

A company oriented approach as is described below, means that we will turn back to the practice of the farm as a whole as well as the practice of other companies in the chain. But in line with developments regarding ecolabelling, the focus will be on the intermediate level of environmental performance, i.e., on companies producing for the general market and not for a selected public (see *Table 1* for a positioning of the present strategy).

Table 1: Product and company in different approaches for ecologising agriculture

	basic environmental requirements	improved environmental management	strictly environmental management
Product	environmental product demands	agro-ecolabel	organic labels
Company	environmental permits	certification of companies	organic farms

For each of the different links in the chain, the criteria will be discussed: are they already used, what are the possibilities? A distinction will be made between three types of criteria. First, there are procedural criteria, such as the requirement in EMAS and EMS of compliance with existing regulations, the regular audit and, in EMAS only, the required statement to the public. Secondly, there is both in EMAS and EMS the requirement of a traceable continuous improvement in environmental performance. For this aim, quantitative indicators are needed for measuring this improvement. Thirdly, one may think of benchmarks, limits which are not to be surpassed in order to qualify for a certificate. These can be either qualitative (this or that substance is not to be used) or quantitative (this level is not to be surpassed).

3 The Role of Agricultural Producers

We start with the agricultural producers, the farms; upstream requirements may be taken along at this level. A number of developments are taking place at another level indicated above and which can be characterised as "good agricultural practice" [8]. In the Netherlands, for instance, these include so called "green stables" for intensive cattle breeding, environmentally sound croppingsystems (MBT). At the moment, in the Netherlands there are requirements for MBT for vegetables (glasshouses and outdoor growing), fruit and mushrooms. In 1996, 95 % of the vegetable growers with glasshouses participate in the MBT, 20 to 80 % of the outdoor vegetable growers (depending on the type of crop), 50 % of the mushroom growers and 65 % of the fruitgrowers [9]. Interesting is that the focus originally has been on the more industrial branches of agriculture; However, soil based cultures like arable farming and dairy farming are now following.

With the green stables for cattle [10] the requirements regard criteria targeted at reduction of ammonia emission by 50 %, such as a tilt of 3 % of the stable floor for manure discharge, epoxy coating of the floor, discharge of manure to a covered manure tank, and a maximum surface area of 3 m^2 per cow. With MBT the requirements regard criteria such as integrated pest control, registration of the use of pesticides and fertilizer, purification and reuse of rockwool, collection of plastics and organic waste for recycling, energy use and approved spraying and fertilizer equipement. Also some voluntary measures are given such as the use of anti-drift nozzles, unsprayed crop edge of 1 m along ditches and use of a environmental yardstick for the choice of pesticides etc. [11, 12]. In MBT, there are different controles: registration controle (administration of the use of pesticides by the company, controled by agricultuaral auction or purchasing company), company audits by an external organisation (controle of administration of pesticides, fertilizer, used amount of electricity, gas, etc.) and random-residue surveys in agricultural products by measurements (incl. comparision with the pesticide registration) by external agencies.

By breaking the rules, a farmer can be excluded from MBT for a longer or shorter period; he can be excluded from the auction or, in the case residues have been detected in the products, he has to pay the costs of the chemical research carried out by the external agency.

We can observe that criteria of all three types are used. Most of them are in terms of quantitative indicators but, for instance, the criteria on the green stables and MBT are clearly of a benchmark type. At present, the agricultural producers are not included in the scope of EMAS and EMS. If that would be realised, a question is if it is possible to establish benchmark criteria under the umbrella of EMAS or EMS or that further detailing of requirements is only possible by national (branche)-organisations.

To our opinion, it is important that the scope of the international certification systems will indeed be extended to MSE, in particular also to agricultural farms; the trade aspect alone does already justify this. An example are dutch horticultural products, which meet rather pronounced suspicion, for example, on the German market, because of their industrialised way of production. An international authoritive certificate, which would show that good environmental practices have been applied all along the chain, may be a strong weapon against such mistrust for the products concerned. Another advantage for the producer might be the possibility to get guaranteed sale down- and upstream the agro-production chain, based on longer turn arrangements with the processing industry, wholesale companies or retailers.

4 The Role of the Processing Industry and Wholesale Companies

In the production chain between producers and retailers there will be several intermediate companies, such as processing industry and wholesale companies. In the agro-pro-

duction chain one can thank about agricultural auctions, canneries, milk factories, slaughterhouses etc. The processing industry and wholesale companies are covered by the scope of the EMAS regulation and EMS standard. This means that certification activities are well under way. For example, with respect to the EMS standard in France the Ministry of Agriculture has selected ten companies of the food processing industry which can, with support of the ministry, prepare an application. The selected companies include the dairy factory Danone, the tinning factories Bonduelle and Daucy and the mushrooms tinning factory Champi Jandou. It can be expected that procedural criteria and quantitative indicators will constitute the core of the criteria setting. The advantage of company certification for the processing industry and wholesale companies might be the image (by general advertising etc.) but also the possibility to get guaranteed sale downstream and guaranteed supply upstream in the agro-production chain.

5 The Role of the Retailer

As was pointed out in the introduction the retailer will often be the steering factor in the company chain. This surely holds true for the agricultural production-consumption chain. An example concerns the Sainsbury company, one of the major retailers of the UK. In the environmental programme 91 shops, 363 supermarkets and 12 hypermarkets are included. Recently, the first environmental report of the environmental programme of this company has been published [13]. On the one hand, it consists of measures directed at the environmental management of the company itself; on the other hand it includes measures aiming at indirect impacts, in particular related to upstream suppliers.

The **first group** of management measures consists of: the type of planning and store development including the choice of building sites and public transport facilities; store design and operation including measures for energy conservation, refrigerant management, fuel filling station design, water protection and water conservation; waste management including product packaging, transit packaging, product waste, and recycling options for customers; transport including the minimisation of truck transport by optimisation of the distribution system, the quality of the business car fleet and measures related to food sourcing.

The **second group** of measures relate to: the requirement of integrated crop management system (ICMS) for all food products and, in addition, the requirement of organically grown produce, if and where there appears to be demand for that; timber and forest products from sustainable forestry only, as guaranteed by the Forest Stewardsip Council trademark in which also WWF and Greenpeace participate; the provision of alternatives for peat products; and the exclusion of products like dolphin-unfriendly tuna.

Also **other aspects** are included in the programme, such as a focus on products without animal testing; meat products only from farms which comply with animal welfare standards; and, again in another direction, a focus on food products which are in line with a sound nutritional strategy. These requirements regard both characteristics of separate products, as well as criteria on the way in which these products are produced. The company explicitly expresses its wish to broaden this even wider to the conservation practice of the farm as a whole.

The crop management systems are required from both British and abroad suppliers. At present, for 30 types of vegetables and fruit management systems are established. By the end of 1996, it is the aim that 88 % of the British produce and 57 % of the overseas produce will be grown to integrated crop management system protocols.

The requirements are clearly of the three types which were distinguished above. Some procedural criteria have to be met (always compliance with existing standards), the core consists of quantitative indicators (with respect to food sourcing buying UK produce rather than overseas), and on a number of points benchmarks are set (with organically grown produce no use of fertilizers or pesticides).

The implementation of the programme consists of a variety of measures. Best Practice Guides for all product groups are being prepared in a 5 years scheme, with total costs of only about 215,000 British pounds. Furthermore, "partnerships in produce" are established with the suppliers, which imply long term contracts under the condition that the criteria are met. The implementation of the integrated crop management system still depends on the control of the protocols by the farms themselves. A need is expressed for industry wide codes within the UK with a more open control system. And for ICMS training programmes are being developed.

A framework is used which is developed by the company itself because retailers are not contained within the scope of the international certification systems. Comparable examples are arising in other countries. Thus, in the Netherlands the retailer Albert HEIJN is establishing long- term contracts with food suppliers on integrated crop management systems since 1991. Requirements are at the level of crop production systems, not management of the farm as a whole. Likewise, as example from the non-food side of agriculture, main clothing stores are including requirements on environmental management in their contracts with cotton and wool producers.

6 The Role of the Consumer

In the introduction it was already expressed that, in contrast to product oriented policy, a company oriented approach is not directly targeted at consumers. It has a more low key character and focuses on information and agreements between companies in the chain. Still consumers may be involved in different ways. Information may be given in an other way, for instance in a public statement about the annual audit (as required by EMAS), or as a general remark in advertising expressing that the company concerned owns the environmental certificate. Also the opening of a "green corner" in a supermarket, only for products from certified farms is a posibility. Again, the in-

formation is not given on a product level, but the message may still be quite clear. The image of the company corresponds with trust from the consumer.

In respect to product labelling, a major advantage of certification of companies for the consumer will be that information is given on the main strategy: it is not longer necessary to look in the shop on the different products (sometimes on the back). In the hole shop or at least in the "green corner" there will be environmentally friendly products. Finally, the price of the products of certificate companies will be equal to the current products. So, the slogan: 'environmently friendly is expensive' will be no longer true.

7 The Role of Authorities

Certification is to be regarded as a policy beyond governmental standards; it is performed by and for companies. However, this does not preclude any governmental influence. Two major areas of such an influence can be distinguished:

Firstly, there can be financial connections. The presence of an environmental certificate may well be a prerequisite for the provision of subsidies for environmental investments or for tax redemptions, like green investments.

Secondly, there can be a relationship with the granting of environmental permits. Thus, a permit may be a requirement for obtaining an environmental certificate, or, reversely, the presence of a certificate may shorten the procedure for an environmental permit. With respect to the role of authorities, the difference with product oriented policy is quite clear; the above measures can (nearly) only be taken at the level of a company as a whole.

8 Questions

Many questions have still to be answered, some of which by desk research, some by practice. First of all, questions are at stake regarding the type of requirements to be set.

Where should procedural criteria suffice, where are common indicators required for measuring improvement, and where is a need for generally established benchmarks?

The comparability between certificates will increase with the latter type of criteria, but at the cost of the flexibility of the procedure. If benchmarks are desirable, flexibility may still be sufficiently present if the criteria set at the national level. This is comparable with the European ecolabelling procedure in which the different member states can decide to set criteria in addition to the criteria which are set at the European level.

A question which is rather closely linked with the foregoing one concerns the **way in which control is exerted.** For EMAS and EMS, the responsibility for control lies in hand of the accrediting organisations, i.e., national organisations which mandate other institutions to provide certificates. Likewise, the control will be mandated to these institutions. It will be clear that such a procedure may well work with large companies but may come into considerable trouble with SMEs. The problem is diminished if criteria are chosen which are easy to control but that will not always be possible. A core characteristic of this approach is that it should be supported by self control of companies or branche organisations and social control between the different links in the agro-production chain. It is a core point that the right context for this will be identified.

A last point which we want to raise here are the **methodological aspects.** Just as LCA is generally regarded as the most appropriate analytical tool supporting product oriented policy, the question can be raised which analytical tool may support certification in a production-consumption chain. A common starting point will lie in a flowchart of processes linked to unit operations or companies. For the company chain, this will be limited to forground companies only [2] and will generally be confined to a cradle-to-gate chain, ending with the retailer. The retailer may, however, also take the responsibility for recycling of the waste. Such flowcharts will help to systematically find the key issues for the **Best Practice Guides**, as are developed in the example of the retailer presented above. Given the budget of this process, just above 200,000 pounds for a five year programme covering all products of a leading retailer, the studies concerned will be in no way comparable with usual LCA studies. For the more critical issues, in particular about topics which require quantitative benchmarks, more in depth information will have to be provided by a "company ecobalance", a physical input-output analysis for one unit process, the given company (a gate-to-gate LCA) [14].

There are at least two points where LCA may become quite essential in this process for going beyond gate-to-gate:

Firstly, LCA may, in a simplified form, well play a role in the discussion which products may have to be removed from the assortment of a certified retailer: where should consumers be given a choice between different products (like with the choice between peat and peat alternatives) and where is the environmental burden beyond acceptable limits (like with the dolphin unfriendly tuna)?

Secondly, companies will have to include waste management practices in their management programme. Here environmental burdens of different options may not run in parallel to intuitive thinking; then only specific LCA research can bring clarity and constitute the basis for certification requirements. The same may hold true for requirements regarding other closely connected processes, such as energy production or transportation modalities.

9 Conclusions

The conclusions can be summarised as follows:

1. Products and companies are two complementary vehicles for a market oriented approach on a life cycle basis; a company oriented approach may well be enhanced considerably by environmental certification of companies.

2. For the agricultural production-consumption chain, the two approaches were historically merged, but they become increasingly more different.
3. The steering factor in a company based chain will be the company with potentially greatest benefits, which will often be the retailer; we add here that requirements set by retailers will be essential for the survival of good practice systems at the farm level.
4. A company based approach should be directed at an intermediate level of environmental performance, lying between the practice of organic farms and current agricultural practice.
5. For technical requirements, either in terms of quantitative indicators for environmental improvement or in terms of qualitative or quantitative benchmarks, "company ecobalance studies" may be required.
6. LCA will have to play a role in this process, firstly in the form of an ecobalance for the separate companies (gate-to-gate LCAs), and furthermore for specific questions, for instance regarding the choice which products should be excluded from the assortment of certified retailers, or regarding preferable waste management practices.
7. Further research is needed on a number of the above points, but many issues can only be solved by practice itself; it is a hopeful development that such practice appears to be increasing.

The readership is invited for comments on the above presented approach.

10 References

[1] Udo de Haes, H.A., G.R. de Snoo (1996): Companies and products: two vehicles for a life cycle approach? Int.J. LCA 1 (3): 168–170

[2] Udo de Haes, H.A., J-F. Bensahel, R. Clift, C.R. Fussler, R. Griesshammer, A.A. Jensen, in press: Report of the Groupe des Sages on EU Ecolabelling Programme, a SETAC-Europe publication, Brussels

[3] Taylor, A.P. (1996): Overall business impact assessment (OBIA). Proceedings 4th Symposium for Case Studies LCA. 3 Dec. 1996 Brussels, Belgium: 181–187

[4] International Organization for Standardization (1995): Environmental management system-specification with guidance for use. Draft internationanl standard ISO/DIS 14001

[5] EEC (1993): EEC Council Regulation no. 1836/93. Allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme (EMAS). Official Journal of the European Communities (10-7-1993, No L 168): 1–17

[6] Rufer, D.F. (1996): Application of ecobalances for change management and education in business. Proceedings of The Second International Conference on Ecobalance. The New Stage of LCA as a Common Language. 18–20 nov. 1996 Tsukuba, Japan: A3–7: 60–65

[7] Stichting Milieukeur (1996): Certificatieschema voor de teelt van aardappelen, tarwe, paprika en uien. Stichting Milieukeur, Den Haag

[8] Ministry of Agriculture, Fisheries and Food (1991): Code of good agricultural practice for the protection of water. UK: Environment Protection Division, Ministry of Agriculture, Fisheries and Food

[9] MBT (Milieubewuste Teelt) (1996): Milieubewuste teelt in 1996. Brochure Centraal Bureau van de tuinbouwveilingen in Nederland. Zoetermeer

[10] Scherpbol, W. (1993): Het groen label is van start gegaan. Rundvee, Schapen en Paarden-Bulletin 1–93: 7–11

[11] Schonwetter, T. (1996): naar een optimum tussen natuur en techniek. 19NU 32 (3): 28–31

[12] MBT (Milieubewuste Teelt) (1996): Registratiemap Milieubewuste Teelt vollegrondsgroenten, glasgroenten, paddestoelen, appels en peren, 1996. Stichting Milieubewuste teelt, Zoetermeer

[13] Sainsbury (1996): J. Sainsbury plc. Environment Report 1996. London

[14] Braunschweig, A., R. Muller-Wenk (1993): Ökobilanzen für Unternehmungen: eine Wegleitung für die Praxis. Haupt, Bern, Stuttgart, Wien

LCA and Ecolabelling

Environmental Certification –

Companies and Products: Two Vehicles for a Life Cycle Approach?

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Environmental certification of companies is a promising tool for steering the economy in a more environmentally sound direction. It can also be put in a chain perspective so that companies which constitute a production-consumption chain will conclude agreements between each other with respect to their environmental performance. A legal basis is formed by the EMS of ISO 14001 and the EMAS directive of the EU. However, apart from procedural aspects, substantive aspects should also be included. The major steering factor consists of the image of a company. This in contrast to product policy, where the major steering factor lies in the purchase behaviour of consumers. The two types of life cycle approaches should complement each other.

Application of LCA in Ecolabelling:

German Experiences

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The present state of how to apply LCA in environmental labelling is described taking into account the current ISO 14 020 and ISO 14 024 standards. There is a consensus to use LCA as a tool for a more scientific oriented environmental labelling. The examples presented in this article verify some practical oriented possibilities to realize this approach.

Results from the worldwide discussion on environmental labelling are realized in the German "Blue Angel" scheme.

Practical examples concern: handdrying systems, paper products, milk packagings, household equipments, television and detergents.